

Application Number 10/649,557
Amendment dated February 26, 2007
Reply to Office Action of November 30, 2006

Amendments to the Claims:

Please amend claims 1, 4, 5, and 10 as follows.

This listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of claims:

1. (Currently Amended) A liquid crystal display driver comprising:
 - a driving voltage generating circuit for generating first through fifth driving voltages and outputting the generated voltages via first through fifth output terminals;
 - a common/segment driving circuit, controlled by a driving polarity signal that is applied to the common/segment driving circuit, for receiving the first through fifth driving voltages to generate a common driving signal and a segment driving signal;
 - a first capacitor connected between the first output terminal and a ground voltage;
 - a second capacitor;
 - a third capacitor; and
 - a control circuit comprising a plurality of switches for controlling connection of the output terminals and the capacitors in response to the driving polarity signal, wherein each switch of the plurality of switches is controlled by the driving polarity signal, and wherein the capacitors are selectively connected to driving voltages used by the common/segment driving circuit, but not to driving voltages not used by the common/segment driving circuit, according to a logic state of the driving polarity signal;
- wherein the control circuit comprises:
- a first switch for connecting one end of the second capacitor₁ in a first position of the first switch₁ to the first output terminal and connecting the one end of the second capacitor₁ in a second position of the first switch₁ to the fifth output terminal in response to the driving polarity signal;
 - a second switch for connecting the other end of the second capacitor₁ in a first position of the second switch₁ to the second output terminal and connecting the other end

of the second capacitor, in a second position of the second switch, to the ground voltage in response to the driving polarity signal;

a third switch for connecting one end of the third capacitor, in a first position of the third switch, to the second output terminal and connecting the one end of the third capacitor, in a second position of the third switch, to the fourth output terminal in response to the driving polarity signal; and

a fourth switch for connecting the other end of the third capacitor, in a first position of the fourth switch, to the third output terminal and connecting the other end of the third capacitor, in a second position of the fourth switch, to the fifth output terminal in response to the driving polarity signal.

2. (Cancelled)

3. (Original) The liquid crystal display driver as claimed in claim 1, wherein the common/segment driving circuit generates the common driving signal and the segment driving signal using the first driving voltage, the fourth driving voltage, the fifth driving voltage, and the ground voltage when the driving polarity signal is in a first logic state, and generates the common driving signal and the segment driving signal using the first driving voltage, the second driving voltage, the third driving voltage, and the ground voltage when the driving polarity signal is in a second logic state.

4. (Currently Amended) The liquid crystal display driver as claimed in claim [[2]]1, wherein when the driving polarity signal is in the first logic state, one end of the second capacitor is coupled to the fifth output terminal by the first switch, the other end of the second capacitor is coupled to the ground voltage by the second switch, one end of the third capacitor is coupled to the fourth output terminal by the third switch, and the other end of the third capacitor is coupled to the fifth output terminal by the fourth switch.

5. (Currently Amended) The liquid crystal display driver as claimed in claim [[2]]1,

wherein when the driving polarity signal is in the second logic state, one end of the second capacitor is coupled to the first output terminal by the first switch, the other end of the second capacitor is coupled to the second output terminal by the second switch, one end of the third capacitor is coupled to the second output terminal by the third switch, and the other end of the third capacitor is coupled to the third output terminal by the fourth switch.

6. (Original) The liquid crystal display driver as claimed in claim 1, wherein the voltage difference between every two adjacent driving voltages among the first through fifth driving voltages is the same.

7. (Original) The liquid crystal display driver as claimed in claim 1, wherein the common/segment driving circuit comprises:

a common driving circuit, controlled by the driving polarity signal, for receiving the first driving voltage, the second driving voltage, the fifth driving voltage, and the ground voltage to generate the common driving signal; and

a segment driving circuit, controlled by the driving polarity signal, for receiving the first driving voltage, the third driving voltage, the fourth driving voltage, and the ground voltage to generate the segment driving signal.

8. (Original) The liquid crystal display driver as claimed in claim 7, wherein the common driving signal has the first driving voltage level and the fifth driving voltage level when the driving polarity signal is in a first logic state, and has the second driving voltage level and the ground voltage level when the driving polarity signal is in a second logic state.

9. (Original) The liquid crystal display driver as claimed in claim 7, wherein the segment driving signal has the fourth driving voltage and the ground voltage when the driving polarity signal is in a first logic state, and has the first driving voltage and the third driving voltage when the driving polarity signal is in a second logic state.

10. (Currently Amended) A liquid crystal display driver comprising:

- a driving voltage generating circuit for generating first through fifth driving voltages to output the generated driving voltages via first through fifth output terminals;
- a common/segment driving circuit, controlled by a driving polarity signal that is applied to the common/segment driving circuit, for receiving the first through fifth driving voltages to generate a common driving signal and a segment driving signal;
- a first capacitor connected between the first output terminal and a ground voltage;
- a second capacitor;
- a third capacitor;
- a first switch for connecting one end of the second capacitor₁ in a first position of the first switch₁ to the first output terminal and connecting the one end of the second capacitor₁ in a second position of the first switch₁ to the fifth output terminal in response to the driving polarity signal;
- a second switch for connecting the other end of the second capacitor₁ in a first position of the second switch₁ to the second output terminal and connecting the other end of the second capacitor₁ in a second position of the second switch₁ to the ground voltage in response to the driving polarity signal;
- a third switch for connecting one end of the third capacitor₁ in a first position of the third switch₁ to the second output terminal and connecting the one end of the third capacitor₁ in a second position of the third switch₁ to the fourth output terminal in response to the driving polarity signal; and
- a fourth switch for connecting the other end of the third capacitor₁ in a first position of the fourth switch₁ to the third output terminal and connecting the other end of the third capacitor₁ in a second position of the fourth switch₁ to the fifth output terminal in response to the driving polarity signal, and wherein the capacitors are selectively connected to driving voltages used by the common/segment driving circuit, but not to driving voltages not used by the common/segment driving circuit, according to a logic state of the driving polarity signal.

11. (Original) The liquid crystal display driver as claimed in claim 10, wherein the common/segment driving circuit generates the common driving signal and the segment driving

signal using the first driving voltage, the fourth driving voltage, the fifth driving voltage, and the ground voltage when the driving polarity signal is in a first logic state, and generates the common driving signal and the segment driving signal using the first driving voltage, the second driving voltage, the third driving voltage, and the ground voltage when the driving polarity signal is in a second logic state.

12. (Original) The liquid crystal display driver as claimed in claim 10, wherein when the driving polarity signal is in a first logic state, one end of the second capacitor is coupled to the fifth output terminal by the first switch, the other end of the second capacitor is coupled to the ground voltage by the second switch, one end of the third capacitor is coupled to the fourth output terminal by the third switch, and the other end of the third capacitor is coupled to the fifth output terminal by the fourth switch.

13. (Original) The liquid crystal display driver as claimed in claim 10, wherein when the driving polarity signal is in a second logic state, one end of the second capacitor is coupled to the first output terminal by the first switch, the other end of the second capacitor is coupled to the second output terminal by the second switch, one end of the third capacitor is coupled to the second output terminal by the third switch, and the other end of the third capacitor is coupled to the third output terminal by the fourth switch.

14. (Original) The liquid crystal display driver as claimed in claim 10, wherein the voltage difference between every two adjacent driving voltages among the first through fifth driving voltages is the same.

15. (Original) The liquid crystal display driver as claimed in claim 10, wherein the common/segment driving circuit comprises:

a common driving circuit, controlled by the driving polarity signal, for receiving the first driving voltage, the second driving voltage, the fifth driving voltage, and the ground voltage to generate the common driving signal; and

a segment driving circuit, controlled by the driving polarity signal, for receiving the first

driving voltage, the third driving voltage, the fourth driving voltage, and the ground voltage to generate the segment driving signal.

16. (Original) The liquid crystal display driver as claimed in claim 15, wherein the common driving signal has the first driving voltage level and the fifth driving voltage level when the driving polarity signal is in a first logic state, and has the second driving voltage level and the ground voltage level when the driving polarity signal is in a second logic state.

17. (Original) The liquid crystal display driver as claimed in claim 15, wherein the segment driving signal has the fourth driving voltage level and the ground voltage level when the driving polarity signal is in a first logic state, and has the first driving voltage level and the third driving voltage level when the driving polarity signal is in a second logic state.

18. (Previously Presented) A method for stabilizing driving voltage levels in a liquid crystal display driver including a driving voltage generating circuit for generating first through fifth driving voltages and outputting the generated voltages via first through fifth output terminals, and a common/segment driving circuit, controlled by a driving polarity signal that is applied to the common/segment driving circuit, for receiving the first through fifth driving voltages to generate a common driving signal and a segment driving signal, the method comprising:

connecting a first capacitor between the first output terminal and a ground voltage;

when the driving polarity signal is in a first logic state, connecting one end of a second capacitor to the fifth output terminal by a first switch in a first position of the first switch, connecting the other end of the second capacitor to the ground voltage by a second switch in a first position of the second switch, connecting one end of a third capacitor to the fourth output terminal by a third switch in a first position of the third switch, and connecting the other end of the third capacitor to the fifth output terminal by a fourth switch in a first position of the third switch; and

when the driving polarity signal is in a second logic state, connecting one end of the second capacitor to the first output terminal by the first switch in a second position of the first

switch, connecting the other end of the second capacitor to the second output terminal by the second switch in a second position of the second switch, connecting one end of the third capacitor to the second output terminal by the third switch in a second position of the third switch, and connecting the other end of the third capacitor to the third output terminal by the fourth switch in a second position of the fourth switch, and wherein the capacitors are selectively connected to driving voltages used by the common/segment driving circuit, but not to driving voltages not used by the common/segment driving circuit, according to a logic state of the driving polarity signal.

19. (Original) The method as claimed in claim 18, wherein the common/segment driving circuit generates the common driving signal and the segment driving signal using the first driving voltage, the second driving voltage, the third driving voltage, and the ground voltage when the driving polarity signal is in the first logic state, and generates the common driving signal and the segment driving signal using the first driving voltage, the fourth driving voltage, the fifth driving voltage, and the ground voltage when the driving polarity signal is in the second logic state.

20. (Original) The method as claimed in claim 18, wherein the voltage difference between every two adjacent driving voltages among the first through fifth driving voltages is the same.